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Factors influencing primary care physicians' decision to order prostate-specific antigen (PSA) test for men without prostate cancer

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Abstract

Background. Despite extensive ongoing clinical trials investigating appropriateness of prostate-specific antigen (PSA)-screening, the benefit of PSA-based screening for prostate cancer remains controversial due to the lack of clear evidence for effectiveness of population-based PSA-screening. Notwithstanding, the need to identify the determinants behind PSA-testing decisions, the number of studies that have examined factors affecting the physicians' decision as to whether PSA-testing should be ordered are few. The aim of the current study was to investigate how physician- and patient-related factors influence Swedish primary care physicians' decision to order a PSA test for men harboring no symptoms of prostate cancer within different age groups. *Methods.* A total of 305 physicians filled out the study questionnaire containing items about physicians' attitudes towards PSA-testing and the probability of screening men within different age groups. *Results.* The majority of physicians reported positive attitude towards PSA-testing. However, the likelihood of offering PSA-testing to young men was low, but increased with age. Physicians' opinion about PSA-test as a sufficient screening tool was the only variable affecting physicians' decision of ordering PSA-test regardless of patient age. The level of the patients' worry, and patients request were the most influential factors in age groups between 40 and 70 years old. Patients' physical symptoms were an indicator in age groups above 60 years. *Conclusion.* The decision to screen for prostate cancer using the PSA-test is influenced by several factors and not only those having direct clinical indication for prostate disease. This may lead to unnecessary treatment of some patients.

Prostate cancer (PCa) is the most commonly diagnosed male cancer disease and the sixth leading cause of cancer-related death among men worldwide [1]. In Sweden, PCa is the major cause of cancer death among men [2]. During the last decades, the incidence of PCa has increased, whilst in several countries the mortality rates from PCa have decreased [3]. Some researchers attribute the reduction to the early detection of asymptomatic disease due to widespread testing based on prostate-specific antigen (PSA) measurement [4], and increased rates of treatment for localized PCa, whereas others doubt it as the most appropriate clinical strategy for screening PCa [5]. Although PSA is prostate specific and strongly associated with both the pathological tumor features and treatment outcomes, it is not specific to PCa [6].

Despite extensive on-going clinical trials investigating appropriateness of PSA-screening, the benefit of screening for PCa in healthy asymptomatic men remains controversial due to the lack of clear evidence for effectiveness of population-based PSA-screening [7]. PSA-screening misses a considerable number of patients with PCa (false-negatives) and wrongly suspects others (false-positives). In addition, even when patients have PCa, there are conflicting suggestions about appropriate treatments [8]. However, the European Randomized Study of Screening for Prostate Cancer (ERSPC), after 11 years of follow-up, reported a 29% reduction in prostate-cancer mortality among men who underwent screening for PSA levels [6].

In Sweden, like a number of other countries, the National Board of Health and Welfare do not recommend PSA measurement for screening in asymptomatic men [9]. However, the discussion among researcher and urologists regarding the effectiveness

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of PSA-testing is conflicting. This leads to potential uncertainty among primary care physicians (PCPs). Although PCPs do not directly treat cancer patients, they are likely to perform the screening tests. Tests are performed in an uncontrolled manner ('wild screening') and probably not always with patients' informed consent. Diefenbach and colleagues found that more than half of men who attended screening were unaware of taking a PSA-test and had never heard about it [10]. Studies have shown that after proper information about pros and cons of PSA-test, the interest for testing decreases [11].

When decisions must be made without definitive empirical evidence support, or when guidelines are conflicting or equivocal, personal experience or physician and patient-related factors influence screening decisions [12]. Potential physician-related factors, i.e. knowledge, professional experiences, attitudes toward cancer screening as well as practice characteristics and environment may be important factors affecting physicians' decision to order PSA-testing [13]. According to a number of reports, older and male physicians are more likely to screen asymptomatic men for PCa [14,15]. Also, a positive attitude towards screening is a significant predictor for ordering screening or performing a PSA-test [16].

According to Bunting and colleagues, urinary symptoms [17], and patient request [18] were the most frequent patient-related factor mentioned by physicians as a reason for ordination of PSA-testing.

Despite the need to identify the determinants behind PSA-testing decisions, the number of studies that have examined both patient and physician-related factors affecting the physicians' decision as to whether PSA-testing should be ordered are few. To this end, the main aim of the current study was to investigate: 1) the probability of ordering PSA-test for men without PCa within different age groups; 2) which physician- and patient-related factors (e.g. age, gender and attitudes, patients' symptoms, worry family history of cancer or request) best predict the PCPs' intention to ordinate PSA-test for asymptomatic men.

In the current study, the 'actual behavior' (ordering PSA-test) was not evaluated. However, according to the Theory of Planed Behaviour [19], intention to behave is a strong predictor of the actual behavior.

Method

Subjects

A total of 500 specialized physicians in general practice were randomly selected from the Swedish physician register. In total 305 (61%) physicians between 31 and 65 years old (M = 53 years, SD = 7.1) replied and participated in the study. The sample was stratified for gender and included 162 males and 143 females (Table I).

Instrumentation and procedure

A study specific questionnaire, based on the Theory of Planed Behaviour [19], earlier research, consulting professionals engaged in PSA-screening, and the research teams' prior experience regarding studying men's intention to test for PCa [11], was developed. Before developing the questionnaire, a telephone-based interview was conducted with five male and female general practitioners. The interview contained questions about physicians' attitudes about ordering a PSA-test, experience of PSA-screening and premises for ordering PSA-testing. In a pilot study, 10 general practitioners filled out the first version of the questionnaire. Based on the results of the pilot study a minor rectification was performed in the questionnaire. The final questionnaire comprised a single-item indicator of physicians' intention to order a PSA-test for men without PCa in different age groups, 10 items about physicians' attitudes towards PSA-testing, 12 items regarding physicians' attitudes towards PSA-screening, and six patient-related items (e.g. urinary difficulties and suspected heredity) which could influence the physicians' decision about ordering PSA-testing. Answers were rated on a 7-point scale from 1 (totally disagree or not at all) to 7 (totally agree or a lot). The questionnaire also included 13 demographics and practice characteristics items such as physician age, gender, experience

Table I. Demographic and practice characteristics for physicians (N = 305).

Characteristic	Mean (SD)
Age, years	53 (7.1)
Sex	N (%)
Male	162 (53)
Female	143 (47)
Practice location*	
University town	99 (32)
Other cities	192 (63)
Practice type*	
Health centers	184 (60)
Hospitals	9 (3)
Private practice	24 (8)
Other	55 (18)
Experience as a physician, years	
< 5	1 (0.3)
5–10	20 (6)
10>	280 (93)
Proportion of cancer patients	
< 10%	281 (94)
Approx. 25%	14 (4)
Approx. 50%	1 (0.3)
75%>	4 (1)

*Data is not available for all participants.

of ordering PSA-test, etc., two items related to colleagues' opinions about PSA-test and one single-item indicator of male physician's willingness to take the test himself. The questionnaire was mailed to the participants together with an explanatory letter about the study.

Statistical methods

In order to facilitate the data analysis an exploratory factor analysis was performed on items measuring physicians' attitudes which yield two factors: 'PSA-test' and 'PSA-test as a sufficient screening tool' (All items in the subscale had loadings ≥ 0.40 and Eigen values of at least 1).

The analysis was followed by a confirmatory factor analysis. Eight of 10 original items were included in 'PSA-test' subscale ($\alpha = 0.84$, Eigen value = 5.04, Data not shown) and three of 12 original items were included in 'PSA-test as a sufficient screening tool' subscale (α; Eigen value = 1.92, Data not shown).

Seven items regarding patients' physical symptoms were summarized into one subscale named 'Physical symptoms' ($\alpha = 0.75$, Data not shown).

Based on the research findings [12,20] and logic a number of variables both physician- and patient-related were examined in relation to the physicians' use of PSA-test as a screening tool for PCa. To determine the variables that could predict physicians' intention to order PSA-test for men in five different age groups, a stepwise regression analysis was performed for each group separately. The included independent physician-related variables were: physicians' demographic variables [age, gender, experience, practice location, practice type, whether they followed the debate about PSA-testing, the influence of colleagues opinions, the physicians' attitude towards the general characteristics of the test ('PSA-test'), physicians' belief about the quality of the test ('PSA-test as a sufficient screening tool'), and single-item of physicians' willingness to take the test himself (only filled out by male physicians)]. The later item was removed from the analysis due to its high collinearity with the 'PSA-test as a sufficient toll' factor. The included patient-related factors were: 'physical symptoms', patients' request and worry, suspected hereditary and health status, i.e. suffering from other disease/s. Analyses were repeated in five different age groups.

Results

Following two reminders, surveys were returned by 305/500 (61%) physicians (162 males and 143 females) aged between 31 and 65 (M = 53 years, SD = 7.1) (See Table I for demographics and practice characteristics of the physicians).

Approximately one third of the respondents (32%, n = 99) practiced in a University town and the majority of physicians had more than 10 years' experience as a medical doctor (93%, n = 280). Roughly 60% (n = 184/272) worked at a health center where cancer patients represented only a minor proportion (< 10%) within their practice (Table I).

PCPs reports revealed that there was a wide variation in PSA-testing practices. The frequency of ordering PSA-tests ranged from seldom (14%) to often (12%) with the majority of physicians (85%, n = 218) only using the test occasionally, whilst 1% (n = 4) claimed that they never used PSA-testing (Table II).

The majority of PCPs (95%, n = 291) followed the debate about the PSA-test regularly. A small percentage of PCPs (15%, n = 37) believed that the PSA-test screening was not discussed between their colleagues, whereas 24% (n = 72) reported that the issue was often discussed amongst them. One third of male PCPs (30%, n = 49) reported that they absolutely would not take the test, whilst 17% (n = 27) reported than they definitely would take the test themselves (Table II).

Fourteen percent of the PCPs believed that their colleagues' opinion about the PSA-test absolutely did not affect their attitude about the test, whereas

Table II. Physicians' use of PSA test and their intentions regarding both taking (only male physicians) and ordering the test (N = 305).

	N[1] (%)
How often do you order PSA-testing for your patients?	
Often	34 (12)
Occasionally	218 (73)
Seldom	43 (14)
Never	4 (1)
For how many patients have you ordered PSA-testing during the last year?	
< 50	203 (69)
50–100	72 (24)
100–150	11 (4)
150>	10 (3)
Do you follow the debate regarding PSA-testing?	
Not at all/rarely	13 (4)
Occasionally	195 (64)
Always	96 (32)
Is ordering of PSA-tests discussed among your colleagues?	
No/rarely	46 (15)
Occasionally	182 (61)
Always	72 (24)
Does your colleagues' opinion about PSA-testing affect your attitude to the test?	
No, absolutely not	43 (14)
Moderately	211 (71)
Yes, absolutely	46 (15)
Would you take the PSA-test (only male physicians)?	
No, absolutely not	49 (30)
Maybe	86 (53)
Yes, absolutely	27 (17)

[1]Data was not available for all participants.

14% reported that colleagues' opinion certainly influenced their attitude about the test (Table II).

Probability of ordering PSA-test for men within different age groups (range 1–7)

Influence of patient-related variables. Physicians' response to the question 'How likely is that you order a PSA-test for your male patients?' indicated that the likelihood of ordering a PSA-test for young men (< 40 years of age) who displayed no symptoms of cancer or known risk factors for the disease was low (Median = 1). Only 1% (n = 3) of physicians reported an extremely high probability of ordering PSA-test for men younger than 40 years of age. However, the tendency to order a PSA-test increased as the patients got older (28% for patients > 70 years) (Table III).

In response to the question 'How likely is that the following variables (see Table III), would influence your decision to order a PSA-test?' it appeared that several aspects concerning patients' health status and family history were associated with their decision. In addition to clinical suspicion of PCa (Median = 7), suspected hereditary (Median = 6), clinical suspicion of an enlarged prostate gland (Median = 6), both patients' request (Median = 6) and patients' worry (Median = 6) had a strong impact on probability of ordering of PSA-test for men without PCa symptoms (Table IV). A high proportion of physicians (81%, n = 245) stated that they would ordinate PSA-test for patients due to their worry because of elevated PSA-values and/or request (80.5%, n = 243) (Data not shown).

The variables which had the least influence on physicians' decision were if the patient suffered from other disease/s, defection problems or back pain (Table IV).

Influence of physician-related variables. *PHYSICIANS' ATTITUDES TOWARDS PSA-TEST.* The 'PSA-test' subscale contained general characteristics of the test and included eight items: whether PSA-test is a good test; provides good guidance; good as an aid; a good test for detecting cancer; a complement to palpation; an unreliable; uncertain and useless test (Table V).

The majority of physicians' had a relatively positive attitude towards PSA-test. Roughly a quarter of respondents (21%, n = 65) considered PSA-test as a good test, 30% (n = 92) stated that PSA-test provides good guidance and almost half (47%, n = 143) regarded that as a good compliment to palpation. However, only 2% (n = 6) agreed that PSA-test provides definitive answers (Data not shown).

PHYSICIANS' ATTITUDES TOWARDS PSA-TEST AS A SUFFICIENT SCREENING TOOL. 'PSA-test as a sufficient screening tool' subscale was related to the screening quality and included three items: PSA-test ought to be used for prevention; I am for general PSA-screening; and PSA-test should be included in ordinary health check-ups (Table V).

A small proportion of the PCPs (9%, n = 27) were in favor of general PSA-screening, while 59% (n = 180) of them were against it. Slightly more than half of the physicians (56%, n = 171) disagreed with the idea that PSA-test should be included in an ordinary health check-up (Data not shown).

Predictors of ordering PSA-testing for men in different age groups

Based on previous knowledge and logic, a number of variables were examined in relation to the physicians' intention to order PSA-test for men in different age groups. A significant predictor of whether a PSA-test was likely to be ordered, regardless of patient's age, was considering 'PSA-test as a sufficient screening

Table III. Probability of ordering PSA-test for men without PCa within different age groups.

Item	Age groups				
How likely is it that you would order a PSA-test for your male patients?	**< 40 yrs**	**40–50 yrs**	**50–60 yrs**	**60–70 yrs**	**> 70 yrs**
Median	1.00	2.00	3.00	3.00	3.50
How likely is it that you would order a PSA-test for your male patients?	**< 40 yrs**	**40–50 yrs**	**50–60 yrs**	**60–70 yrs**	**> 70 yrs**
	N* (%)[1]	N* (%)[1]	N* (%)[1]	N* (%)[1]	N* (%)[1]
Extremely low	234 (77)	117 (39)	64 (21)	56 (18)	73 (24)
Very low	45 (15)	85 (28)	46 (15)	39 (13)	41 (14)
Low	9 (3)	47 (16)	44 (15)	37 (12)	37 (12)
Moderate	6 (2)	23 (8)	62 (21)	56 (18)	47 (16)
High	5 (1.7)	18 (6)	44 (15)	48 (16)	37 (12)
Very high	1 (0.3)	5 (2)	22 (7)	48 (16)	39 (13)
Extremely high	3 (1)	6 (2)	17 (6)	20 (7)	28 (9)

*Data was not available for all participants.

[1]Proportion of physicians reporting a high probability of ordering PSA-test.

Table IV. The extent to which different variables influence a physicians' decision to order a PSA- test for men within different age groups (Range 1–7).

Items	Median
How likely is it that the following factors influence you when ordering a PSA-test?	
Physical symptoms:	
Clinical suspicion of prostate cancer	7
Suspected hereditary	6
Clinical suspicion of an enlarged prostate gland	6
Patient has urinary problem	4
Patient has back pain	4
Patient has defecation problems	3
Patient has other diseases	3
Patients request	6
Patients' worry	6

tool'. In addition, patients' worry and request predicted ordination of PSA-test for men between the age of 40 and 70 years. For men older than 60 years, patients' physical symptoms was an additional significant predictor of ordering PSA-test (Table VI).

The explained variance in the regression analysis was 14% for the youngest group of patients and between 36% and 40% for men aged 50 years or older (Table VI).

Discussion

Several studies have reported that despite a lack of conclusive evidence documenting the effectiveness of PSA-testing in PCa screening, primary PCPs use this test extensively. The majority of participants in the present study had a positive attitude towards PSA-test, and admitted ordering PSA-tests regularly. However, less than half (41%) were totally against PSA-based screening. The likelihood of offering a PSA-test to young men (< 40 years of age) was low, but increased with the patients' age.

Table V. Physicians' attitudes towards PSA-test.

Consider how well you agree with the following statements about PSA-test (range 1–7).	Median	n
'PSA-test' subscale		
*a good test	5	298
*provides good guidance	5	298
*good as an aid	5	301
*good test for detecting cancer	5	298
*a compliment to palpation	5	300
*an unreliable test	3	297
*an uncertain test	3	296
*a useless test	1	297
'PSA-test as a sufficient screening tool' subscale		
*ought to be used for prevention	4	301
*I am in favor of general PSA screening	2	303
*should be included in routine health check-ups	2	303

Amongst all tested variables, physicians' opinion about the 'PSA-test as a sufficient screening tool' was the only variable which significantly increased the likelihood of ordering a PSA-test. This was apparent for all age groups. This variable was followed by the degree to which the patient showed sign of worry and requested for a test, which proved to be an indicator across all age groups older than 40 years and younger than 70 years of age.

In line with previous study results [21], the results of the current study indicated that probability of ordering such tests for screening purposes increased with the men's age, but leveled off after 70 years of age. A possible explanation regarding why physicians frequently order PSA-tests may in part be attributed to the increase in patients' awareness, and the fact that the test is easy to perform and does not cause any pain or other physical complications. Another potential explanation could be the fear of lawsuits and the belief that failure to order PSA-tests may lead to potential malpractice claims.

Contrary to other reports [20,21], within the present study, the likelihood of ordering a PSA-test for young men harboring no symptoms of cancer was low, which could be due to following the Swedish National Board of Health and Welfare guidelines, that do not recommend routinely screening asymptomatic young men.

In contrast to other reports [22], our results did not support the notion that physical-symptoms were a strong predictor of whether a physician would order screening and this held true for age groups younger than 60 years.

In line with previous reports [23], our results indicated that in addition to a patients' age, patients' worry and request had substantial influence on the ordering of a PSA-test. This is not a surprising result regarding an increase in public awareness of both the high risk of developing PCa and the availability of a blood test which can detect the cancer. Thus, in a country like Sweden, which is characterized by tax-paid healthcare system and a patient-centred approach, if a patient is worried, there is no reason for the physician to refuse testing.

In contrast to the previous findings [24] we did not observe any association between ordering the PSA-tests and physicians' age, gender, practice location or speciality.

That notwithstanding, a very interesting result was the observation that male physicians' willingness to personally undergo testing, significantly predicted the probability of ordering PSA-test. This finding, consistent with findings in previous studies, may reflect a conflict between following national guidelines and the

Table VI. Factors predicting physicians' intention to ordinate PSA-test for men within different age groups.

Factors	R^2	ß	SE(ß)	t
Intention to refer men < 40	0.14			
• PSA-test as a sufficient screening tool		0.38	0.02	6.04***
Intention to refer men 40–50	0.30			
• PSA-test as a sufficient screening tool		0.52	0.02	8.88***
• Patients' worry and request		0.13	0.03	2.19*
Intention to refer men 50–60	0.36			
• PSA-test as a sufficient screening tool		0.52	0.03	9.33***
• Patients, worry and request		0.23	0.04	4.16***
Intention to refer men 60–70	0.40			
• PSA-test as a sufficient screening tool		0.54	0.03	9.96***
• Patients' worry and request		0.19	0.04	3.27**
• Physical symptoms		0.13	0.02	2.24*
Intention to refer men > 70	0.38			
• PSA-test as a sufficient screening tool		0.56	0.03	10.28***
• Physical symptoms		0.19	0.04	3.49**

*** = $p < 0.000$, ** = $p < 0.001$, * $p < 0.05$

physicians' own opinion. Evidently, variation persists even when clear guidelines are set out. Therefore, a physician's belief that strong evidence does not exist to support routine PSA-based screening for any group of patients drives his/her decision about screening [21].

Methodological discussion

The results of the present study are based on a large heterogeneous national sample with a high response rate (61%) and a wide age range (31–65 years). Other strengths of this study derive from the inclusion of various practice types and locations. Thus, it is envisaged that this data may be generalized to the population of PCPs throughout Sweden and also physicians in other European countries with similar healthcare system.

Nevertheless, one should bear in mind that the results are based on participating physicians' self-reports and not on clinical data regarding why a PSA-test was ordered. Thus, the accuracy of reported estimates may be questionable and differ from the actual PSA ordering behavior.

Furthermore, the determinant variables accounted for 40% of the variance in physicians' reported PSA-test ordination. This implies that there are a number of other variables that influence physicians' decision that are not captured. However, despite these limitations, we believe that the results shed light on some important aspects of PCPs screening behavior and factors that influence their decisions.

Conclusion, research recommendations and practice implications

During a period when the pressure on healthcare and costs for providing preventive services are rising steadily, offering evidence-based and cost-effective care to patients requiring PSA-test is vital. A physician's decision to screen patients for PCa using the PSA-test is crucial and influenced by several factors. According to our findings, a number of factors other than those having direct clinical indication for prostate disease, may be important determinants in a physicians' screening decision. Thus, physicians' behavior is likely to continue along the same lines as their attitudes until an alternative diagnostic tool becomes available.

Without credible data and objective evidence-based guidelines, physicians will continue to make screening decisions on the basis of perceived necessity rather than actual patient preferences and objective data. Furthermore, the ethical aspects of recommending this test need to be carefully considered. Patients should be given the opportunity to discuss the screening rather than directly receive a recommendation to undergo PSA-testing. Numerous reports on informed decision making demonstrate that patients are considerably less likely to choose PSA-testing when comprehensive information about the pros and cons of the method has been provided to them [25,26].

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